

ESTATUS ACTUAL DE DISTRIBUCIÓN DE PECES EXÓTICOS EN EL NOROESTE DE MÉXICO: PENÍNSULA BAJA CALIFORNIA Y SONORA



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ESPECIE EXÓTICA=
ESPECIE EVOLUTIVA Y BIOGEOGRÁFICAMENTE
NO NATIVA A LOS ECOSISTEMAS REFERIDOS

SINÓNIMOS (FULLER ET AL., 1999):

ESPECIE NO NATIVA
ESPECIE ALÓCTONA
ESPECIE INTRODUCIDA

NUMERO DE PECES EXOTICOS REGISTRADOS EN DIFERENTES ESCENARIOS Y ESCALAS GEOGRAFICAS

- **U.S.A. = 536 spp. (Fuller et al., 1999)**
- **California= 162 spp.**
- **Texas= 105 spp.**
- **Florida= 122 spp.**

- **México= 115 spp. (Contreras-Balderas et al., 2008)**
- **Baja California= 27 spp. (Ruiz-Campos, 2008)**
- **Baja California Sur= 6 spp. (Ruiz-Campos, 2008)**
- **Sonora= 26 spp. (Varela-Romero, 2008)**



Los manantiales y oasis en las zonas áridas y semiáridas del Suroeste de Norteamérica contienen una biota hipodiversa pero con alto grado de endemismo, cuyas especies han evolucionado en aislamiento por miles de años y consecuentemente careciendo de estrategias competitivas o antidepredativas.

AGENTE

ESPECIE EXÓTICA

ATRIBUTOS

PLASTICIDAD ECOLÓGICA AMPLIA
CAPACIDAD COMPETITIVA ALTA
TASA DE DISPERSIÓN ALTA
SIN REGULADORES POBLACIONALES
POTENCIAL BIÓTICO ALTO
TASA CRECIMIENTO SOMÁTICO ALTO

CONDICIÓN

ESPECIE INVASIVA

EFFECTOS EN LA BIOTA NATIVA

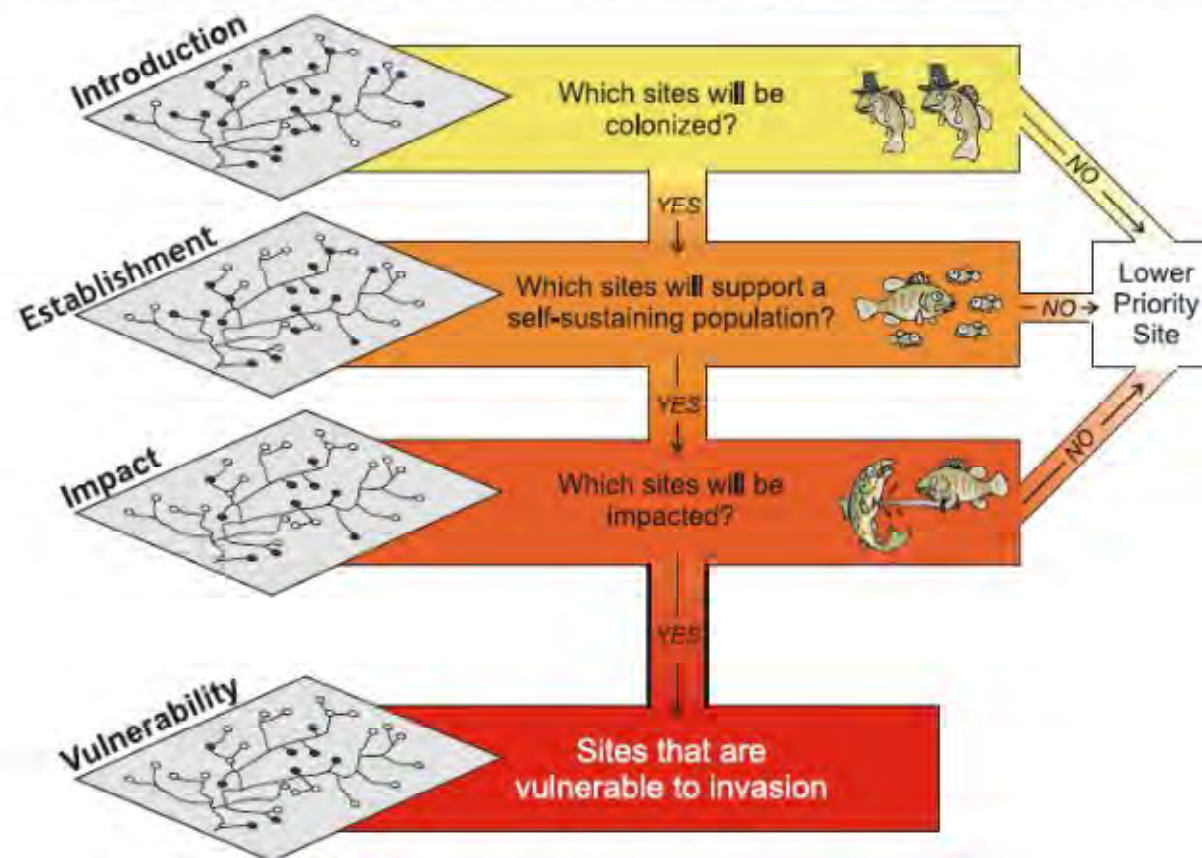
EXCLUSIÓN
COMPETITIVA
Y DEPREDACIÓN

TRANSFERENCIA
ENFERMEDADES
Y PARÁSITOS

PÉRDIDA
DE ESPECIES/
HOMOGENEIZACIÓN
DE LA BIOTA



Fig. 1. A conceptual framework for assessing site vulnerability on a landscape comprised of multiple lakes. The approach separately assesses potential for introduction, establishment, and adverse impact of a specific invasive species for each of a suite of lakes. Assessment of vulnerability for individual lakes can help guide the targeting of invasive species prevention and management efforts.



FEATURE: ENDANGERED SPECIES

Conservation Status of Imperiled North American Freshwater and Diadromous Fishes

ABSTRACT: This is the third compilation of imperiled (i.e., endangered, threatened, vulnerable) plus extinct freshwater and diadromous fishes of North America prepared by the American Fisheries Society's Endangered Species Committee. Since the last revision in 1989, imperilment of inland fishes has increased substantially. This list includes 700 extant taxa representing 133 genera and 36 families, a 92% increase over the 364 listed in 1989. The increase reflects the addition of distinct populations, previously non-imperiled fishes, and recently described or discovered taxa. Approximately 39% of described fish species of the continent are imperiled. There are 230 vulnerable, 190 threatened, and 280 endangered extant taxa, and 61 taxa presumed extinct or extirpated from nature. Of those that were imperiled in 1989, most (89%) are the same or worse in conservation status; only 6% have improved in status, and 5% were delisted for various reasons. Habitat degradation and nonindigenous species are the main threats to at-risk fishes, many of which are restricted to small ranges. Documenting the diversity and status of rare fishes is a critical step in identifying and implementing appropriate actions necessary for their protection and management.



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Stephen J. Walsh,
Noel M. Burkhead,
Salvador Contreras-Balderas,
Edmundo Díaz-Pardo,
Dean A. Hendrickson,
John Lyons,
Nicholas E. Mandrak,

Frank McCormick,
Joseph S. Nelson,
Steven P. Platania,
Brady A. Porter,
Claude B. Renaud,
Juan Jacobo Schmitter-Soto,
Eric B. Taylor, and
Melvin L. Warren, Jr.

Figure 3. Number of imperiled (endangered, threatened, vulnerable, extinct) freshwater and diadromous North American fish taxa by ecoregions as provided in Figure 1 and Table 1.

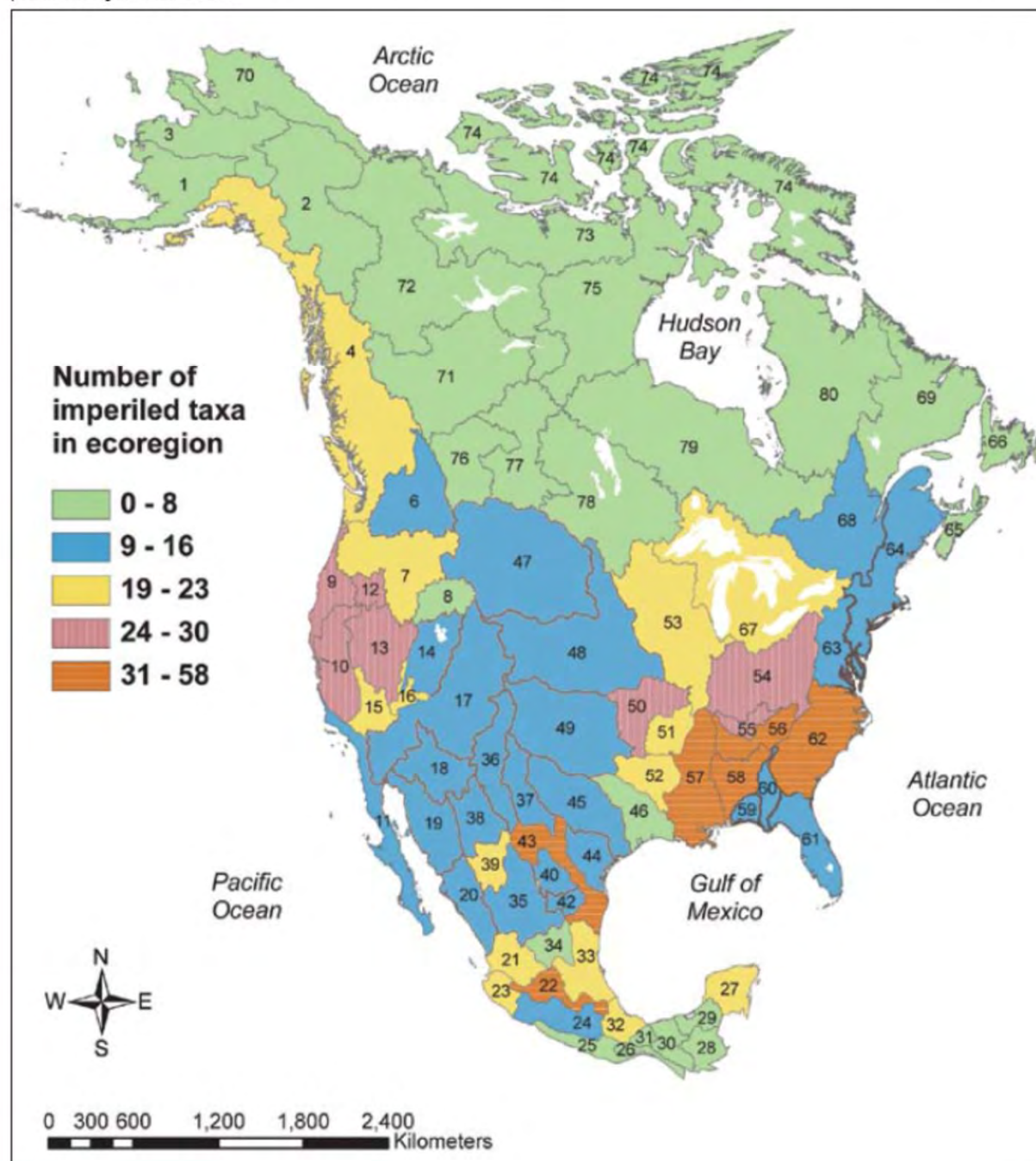


Figure 2. Numbers of imperiled North American freshwater and diadromous fish taxa in each status category as listed previously by the AFS Endangered Species Committee in Deacon et al. (1979), Williams et al. (1989), and this list (2008). Extinct taxa for each year are cumulative based on estimated dates of extinction, whereas delisted taxa are the number of taxa excluded since the previous list.

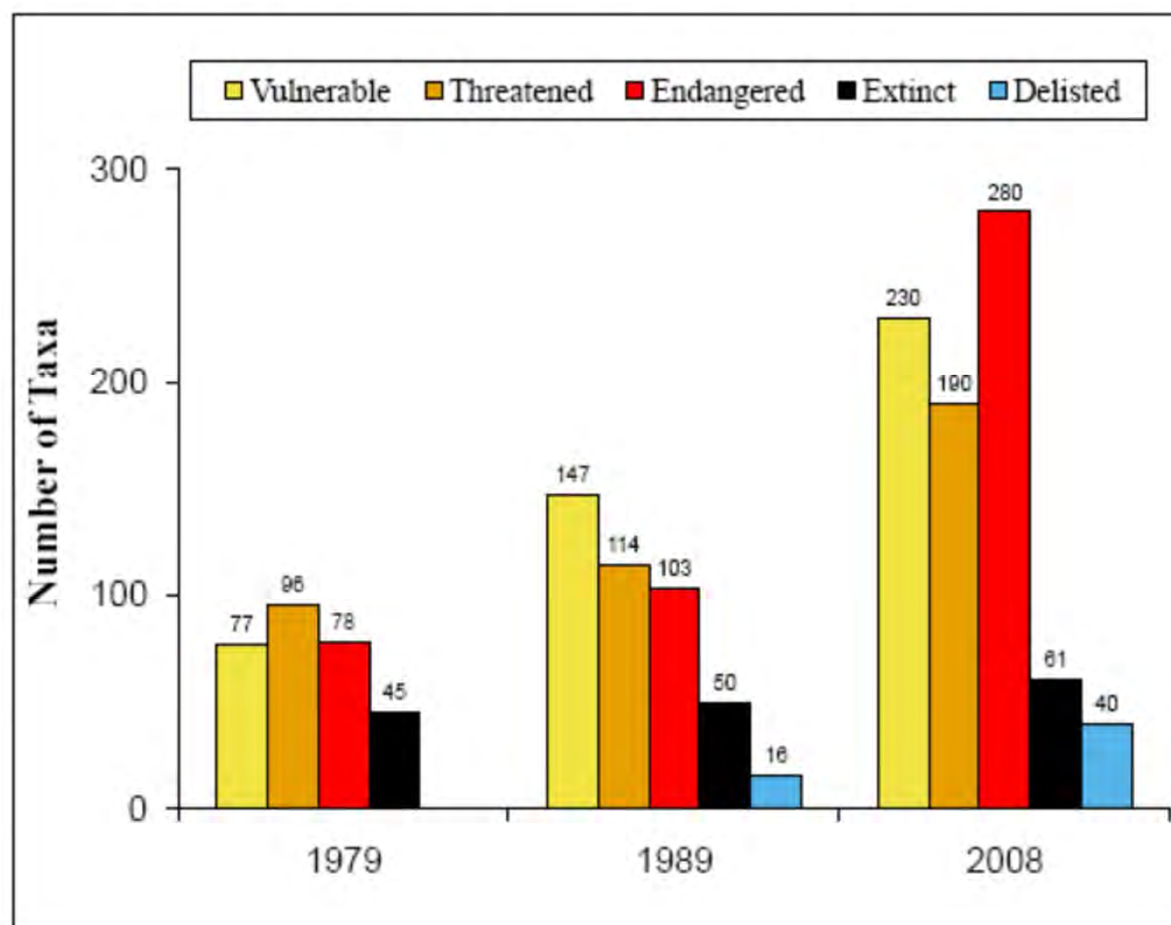


Table 3. Numbers of imperiled North American freshwater and diadromous fishes presented by taxonomic category for the eight most taxon-rich families and the combined remainder as listed in Appendix 1. Percentages in first column are of the total number of imperiled taxa.

FAMILY	TOTAL TAXA AND PERCENT	DESCRIBED SPECIES	UNDESCRIBED SPECIES	DESCRIBED SUBSPECIES	UNDESCRIBED SUBSPECIES	POPULATIONS
Cyprinidae	188 (24.7%)	128	7	27	25	1
Percidae	111 (14.6%)	75	7	4	0	25
Salmonidae	89 (11.7%)	7	2	25	5	50
Goodeidae	48 (6.3%)	38	0	10	0	0
Cyprinodontidae	47 (6.2%)	36	1	9	1	0
Catostomidae	46 (6.0%)	28	6	7	2	3
Poeciliidae	37 (4.9%)	32	4	0	0	1
Ictaluridae	33 (4.3%)	27	2	0	0	4
Other 28 Families	162 (21.3%)	107	26	14	4	11
Total	761 (100%)	478	55	96	38	94



Freshwater fishes and water status in México: A country-wide appraisal.

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Table 1. Fishes at risk or extinct in México, 1963–2006 (modified from Contreras-Balderas and Ramírez-Flores, 1999).

Degree of Risk	1963	1969	1979	1984	1989	1994	1997	2005
Endangered	11	33	29	58	41	59	65	69
Threatened	?	?	12	35	26	60	78	87
Vulnerable/ Rare	?	?	19	26	54	?	36	42
Extinct	7	7	?	?	7	?	19	27
Total	18	40	>67	>126	132	>130	208	225

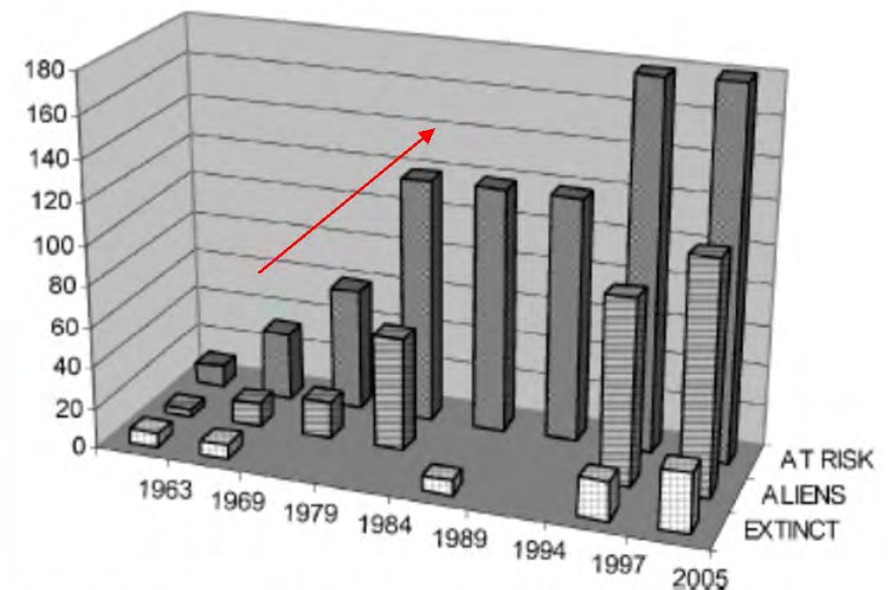
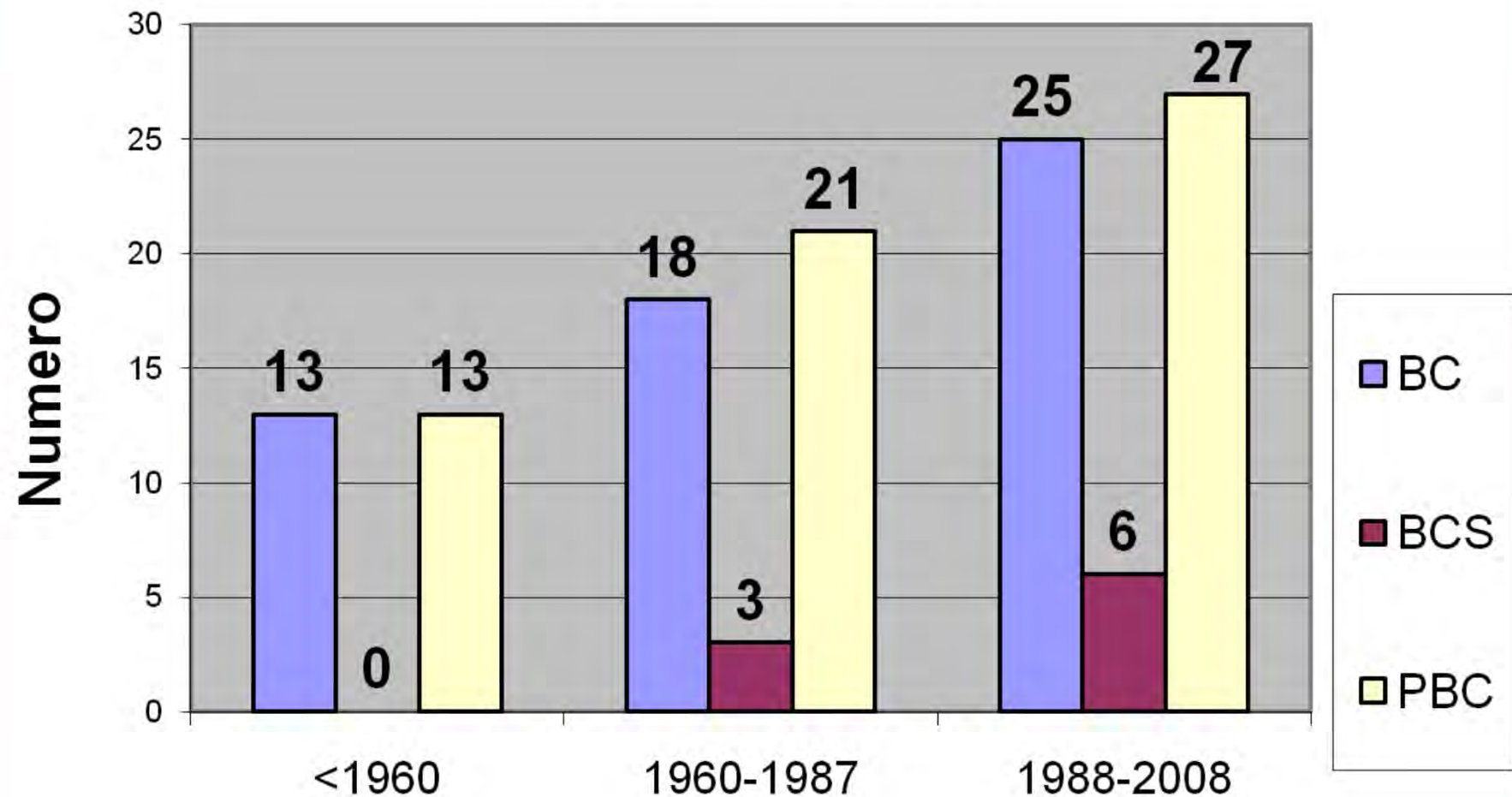


Figure 3. The numbers of species at risk, extinct or exotics (= invasives) in México, 1963 to 2005 (updated from Contreras-Balderas and Ramírez-Flores, 2000). Note the parallel trends for native species at risk and invasive species.

NUMERO DE TAXA EXOTICAS POR ESTADO EN LA PENINSULA DE BAJA CALIFORNIA VS TIEMPO



COLECCIONES ICTIOLÓGICAS REVISADAS

UABC

UANL

DICTUS-UNISON

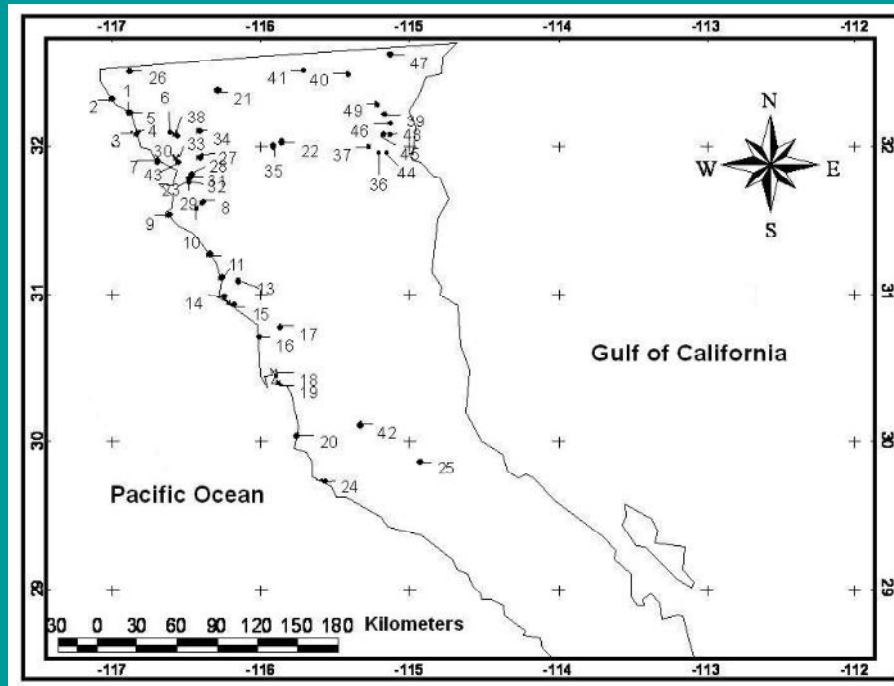
CICIMAR-IPN

CAS

SIO

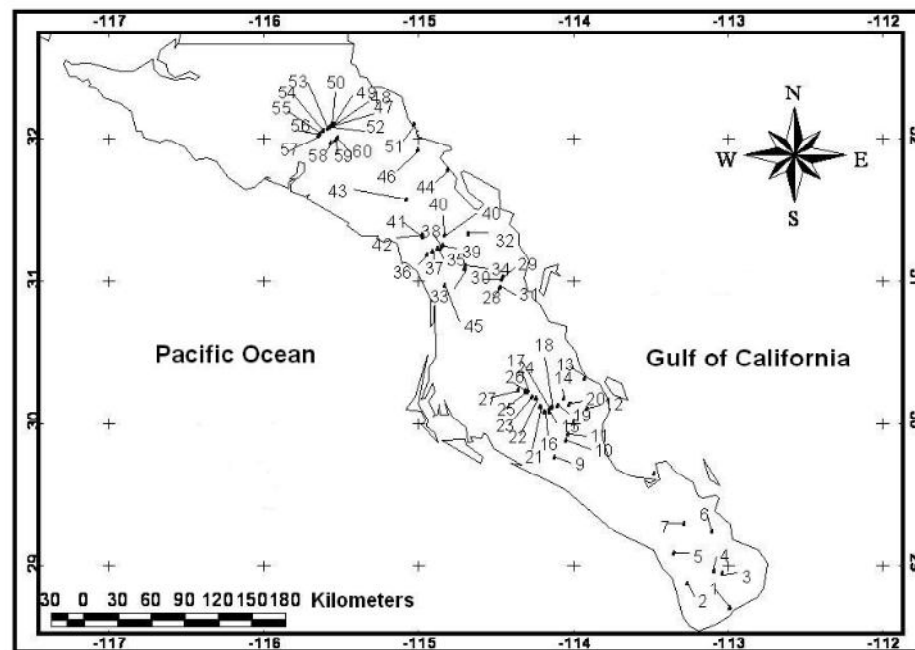
ASU

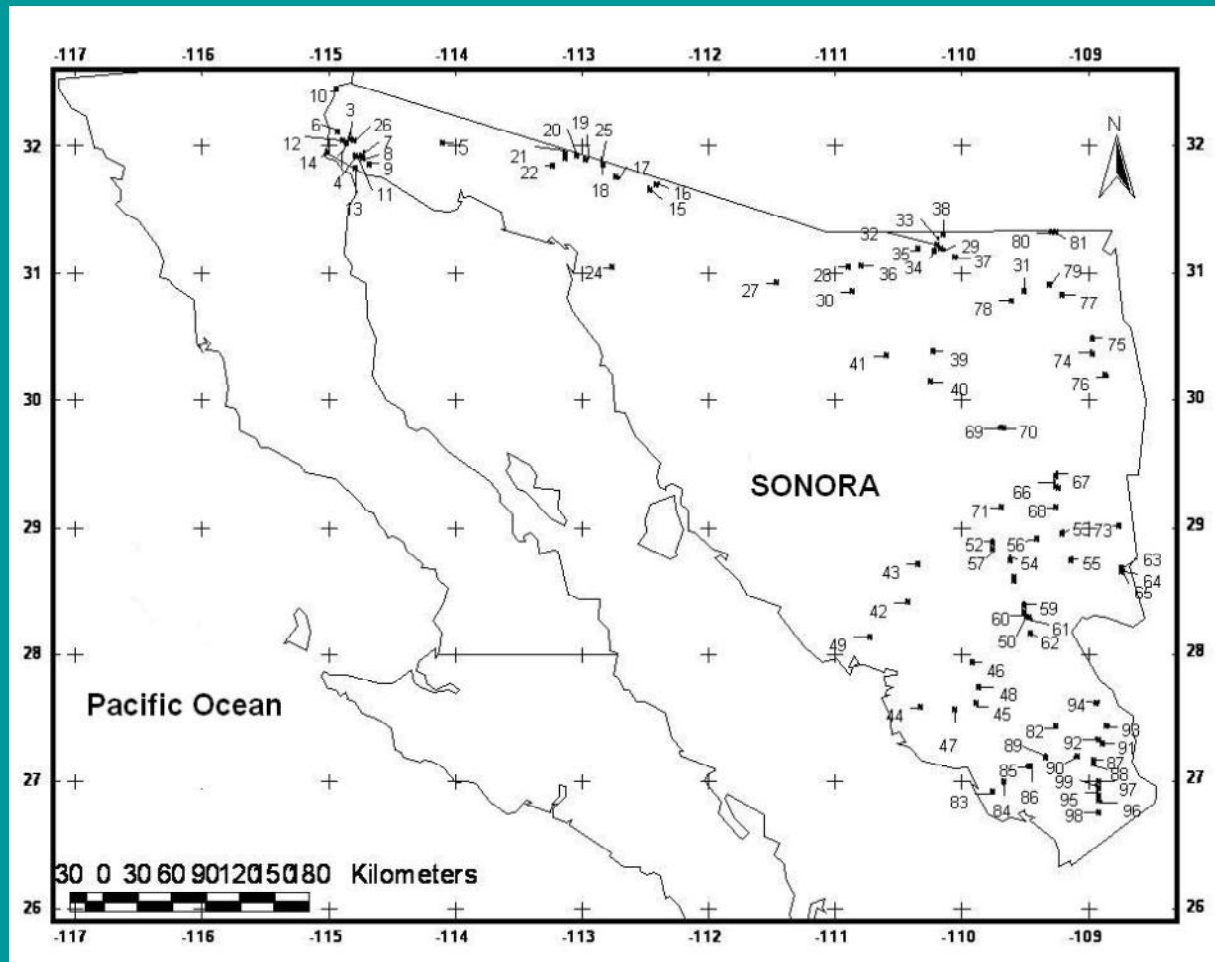
IB-UNAM



**49 localidades de BC
(1983-2009)**

**60 localidades de BCS
(1977-2008)**





**99 localidades de
Sonora
(1986-2008)**

**ESTUDIOS DE CASO:
NOROESTE DE MÉXICO**

DISTRIBUTION AND ABUNDANCE OF THE ENDANGERED KILLIFISH *FUNDULUS LIMA*, AND ITS INTERACTION WITH EXOTIC FISHES IN OASES OF CENTRAL BAJA CALIFORNIA, MEXICO

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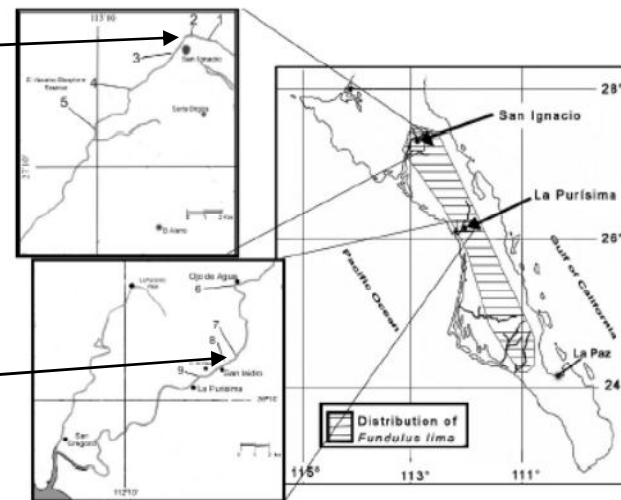


FIG. 1.—Location of fish sampling sites (1-9) in the Río San Ignacio and Río La Purísima basins, Baja California Sur, Mexico. 1, Rancho El Tirón; 2, Lake Side; 3, Pozo Largo; 4, Rancho Los Corralitos; 5, Rancho San Salas; 6, Ojo de Agua; 7, Presa Carambuche; 8, Carambuche; and 9, La Purísima.



Poecilia reticulata



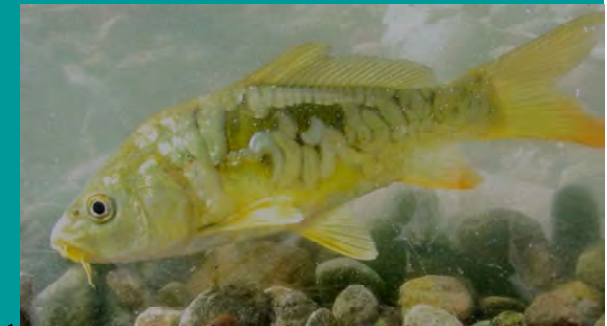
Tilapia cf. zillii



Xiphophorus hellerii



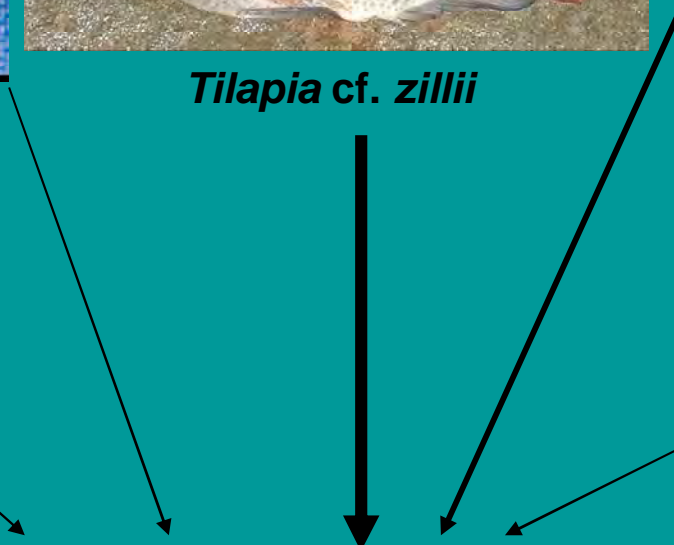
Xiphophorus maculatus



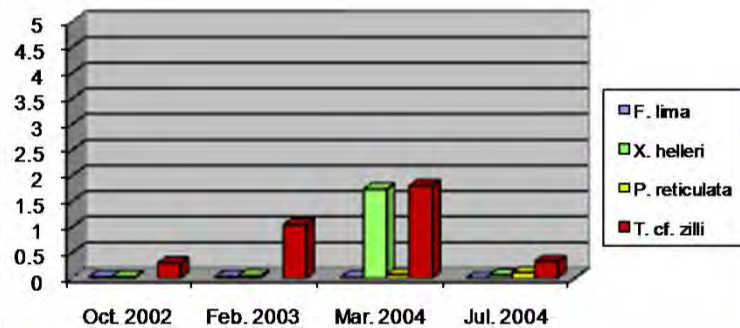
Cyprinus carpio



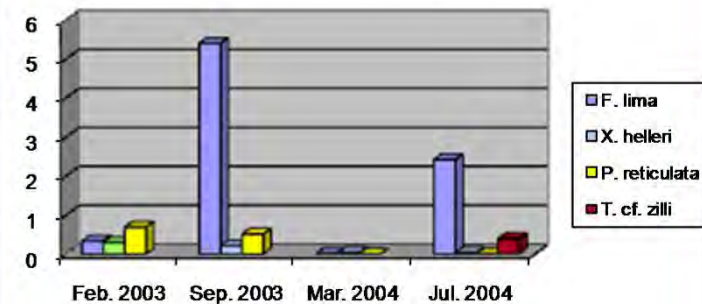
Fundulus lima



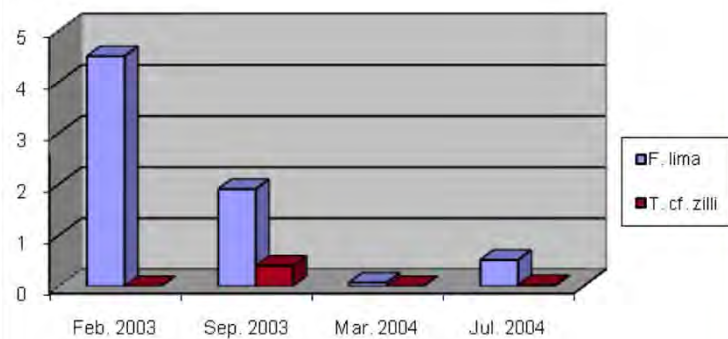
El Tizon
CPUE (ind./trampa/h)



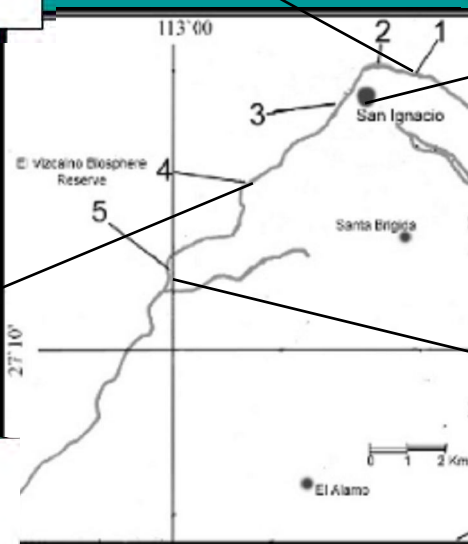
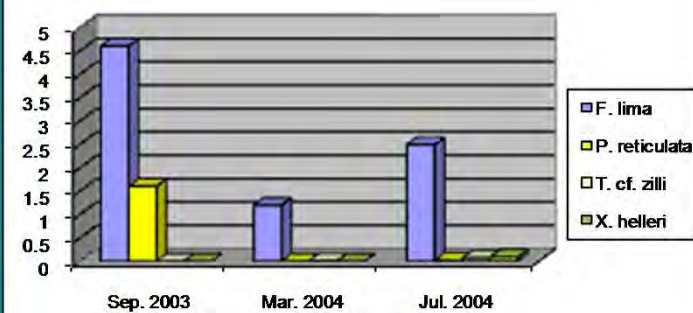
Poza Larga
CPUE (ind./trampa/h)



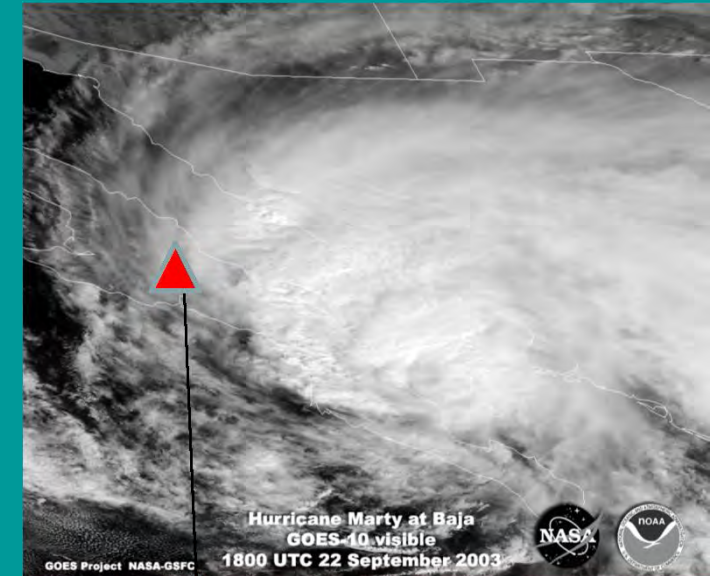
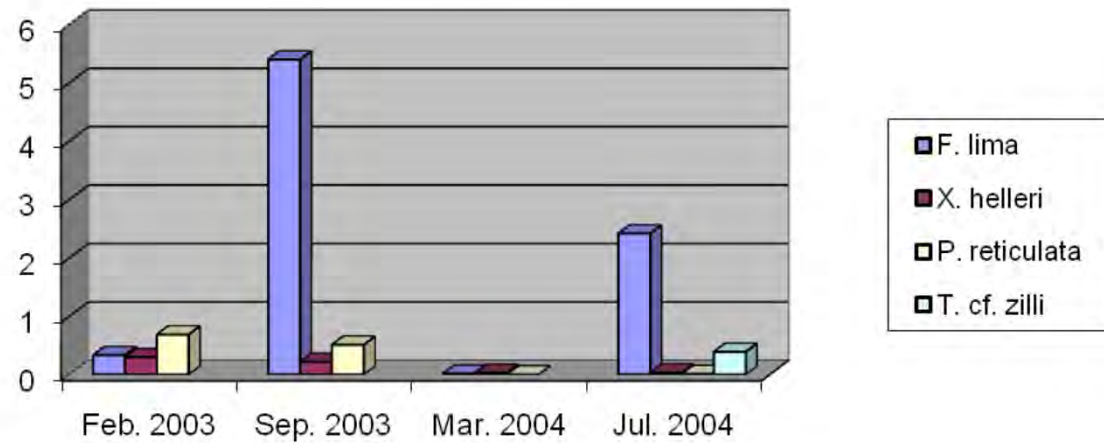
Los Corralitos
CPUE (ind./trampa/h)



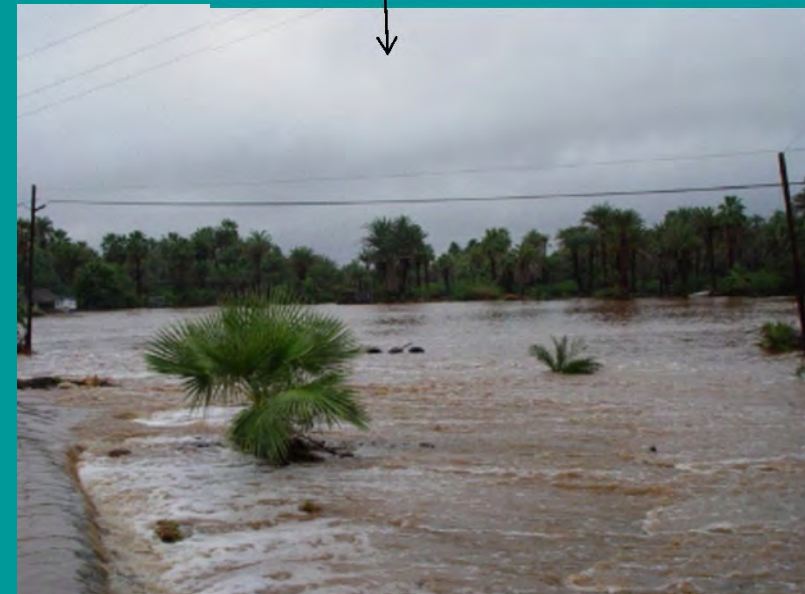
San Sabas
CPUE (ind./trampa/h)



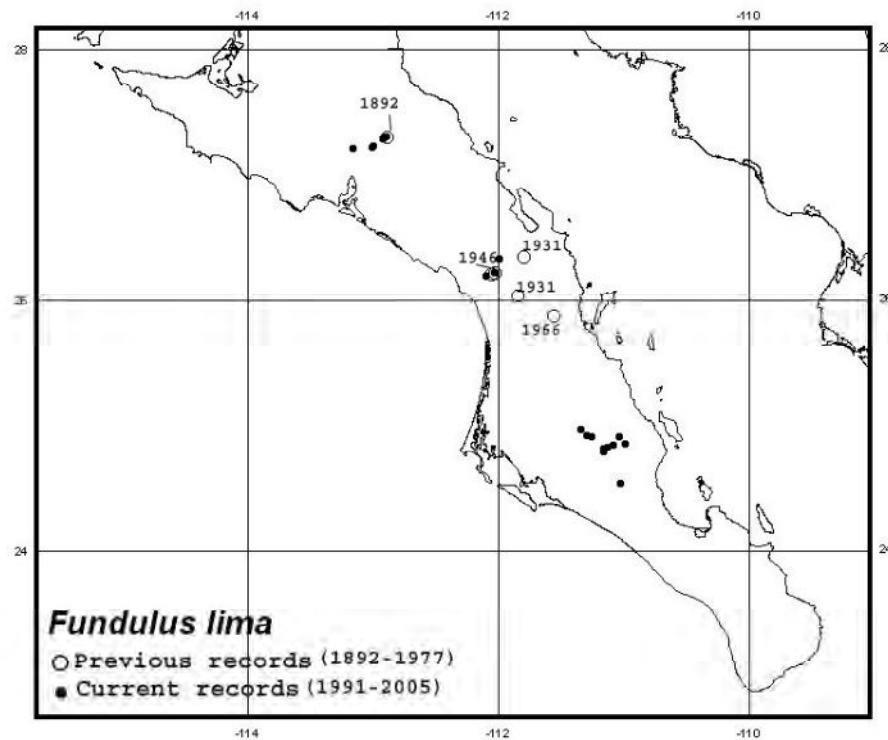
**Poza Larga
CPUE (ind./trampa/h)**



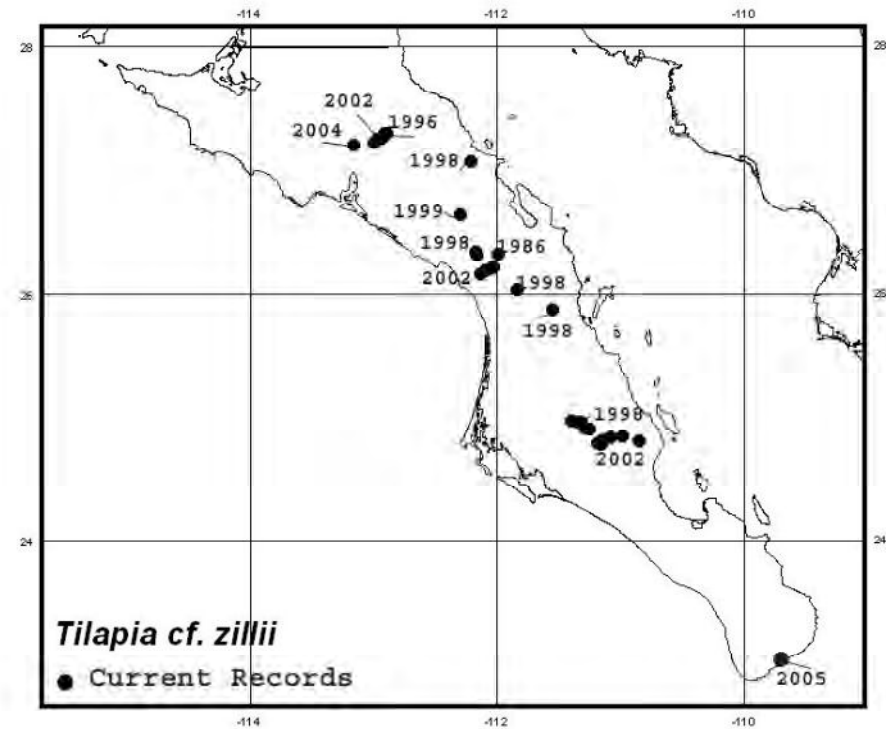
**DISPERSION RAPIDA DE
Tilapia cf. zillii POR CRECIENTES
DENTRO DE LA MISMA CUENCA**



**Efecto del Huracán “Marty” en el
Oasis San Ignacio, 23 Sept. 2003**

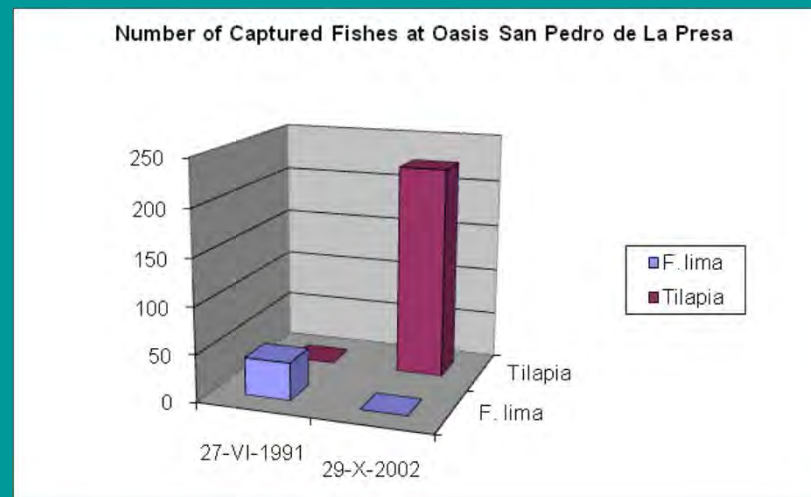
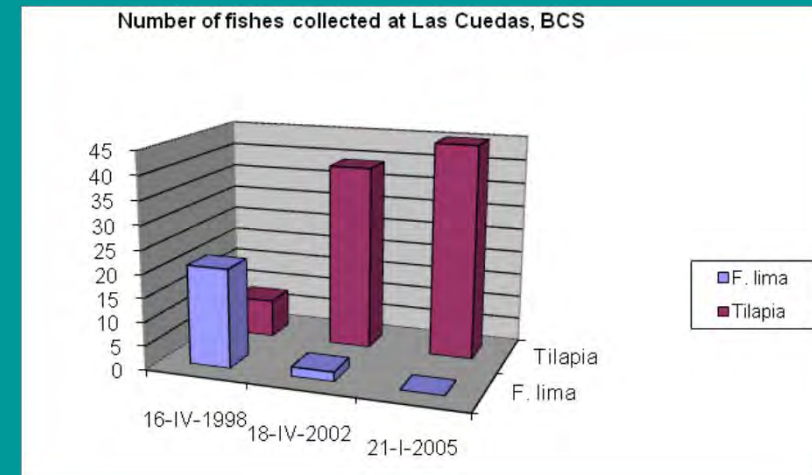
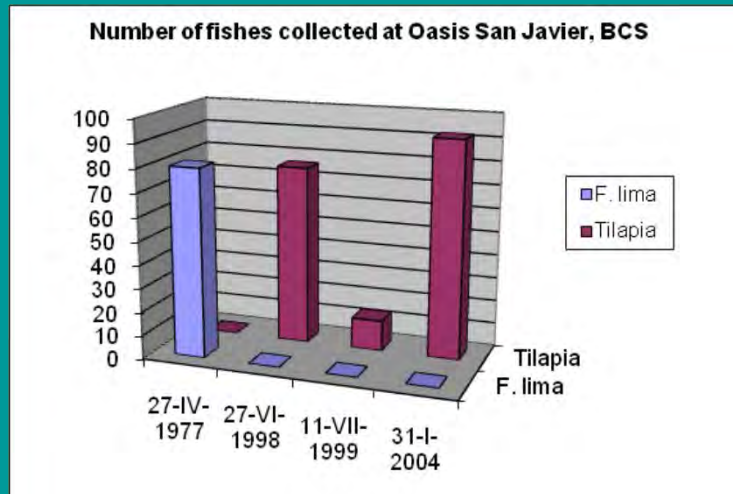


NATIVA



EXOTICA

Poblaciones Extirpadas de *Fundulus lima* por Introducción de *Tilapia cf. zillii*





Distribution, habitat and conservation status of desert pupfish (*Cyprinodon macularius*) in the Lower Colorado River Basin, Mexico

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Figure 1. Sampling sites locations of desert pupfish in the Lower Colorado River Basin, Sonora and Baja California, Mexico.



TILAPIA (*Tilapia cf. zilli*)



MOLLY (*Poecilia latipinna*)



PEZ MOSQUITO (*Gambusia affinis*)

**COMPETENCIA POR
HABITAT Y ALIMENTO**



PEZ CACHORRITO (*Cyprinodon macularius*)



Bagre torito amarillo
(*Ameiurus natalis*)



Róbalo rayado (*Morone saxatilis*)



Carpa dorada (*Carassius auratus*)



Bagre blanco (*Ictalurus catus*)

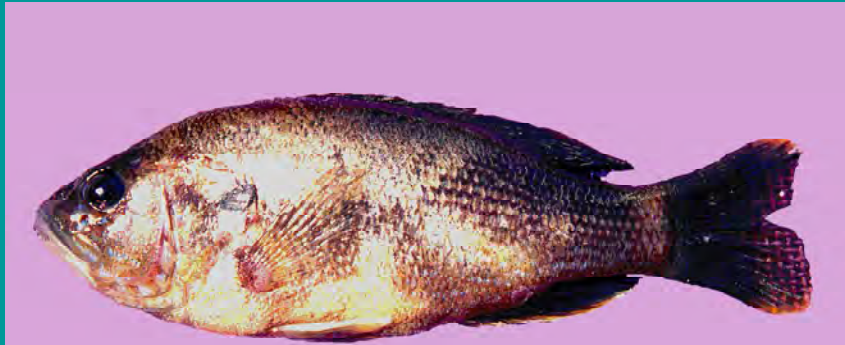


Mojarra oreja roja (*Lepomis microlophus*)

**ESPECIES EXOTICAS
RECIENTES EN LA
PENINSULA DE BAJA
CALIFORNIA**



Sardinilla roja (*Cyprinella lutrensis*)



Mojarra verde (*Lepomis cyanellus*)



Cuchilla (*Dorosoma petenense*)



**Mojarra agalla azul
(*Lepomis macrochirus*)**



Mojarrón (*Lepomis gulosus*)

**ESPECIES INTRODUCIDAS
COMO
PECES FORRAJEROS**



Piltonte (*Pylodictis olivaris*)



Bagre torito amarillo (*Ameiurus natalis*)



Lobina negra (*Micropterus salmoides*)



Robalo rayado (*Morone saxatilis*)

**ESPECIES INTRODUCIDAS PARA
PESCA RECREATIVA**



Robaleta blanca (*Pomoxis annularis*)



Robaleta pinta (*Pomoxis nigromaculatus*)



Tilapia panza roja (*Tilapia* cf. *zillii*)



Tilapia azul (*Oreochromis* cf. *aureus*)



Bagre de canal (*Ictalurus punctatus*)



Carpa común (*Cyprinus carpio*)

ESPECIES INTRODUCIDAS PARA FINES ACUICULTURALES



Carpa dorada (Carassius auratus)



Molly velita (Poecilia latipinna)

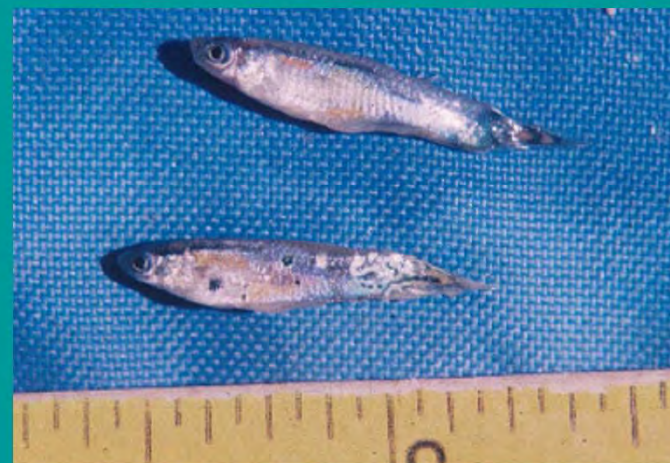


Espadita manchado (Xiphophorus maculatus)



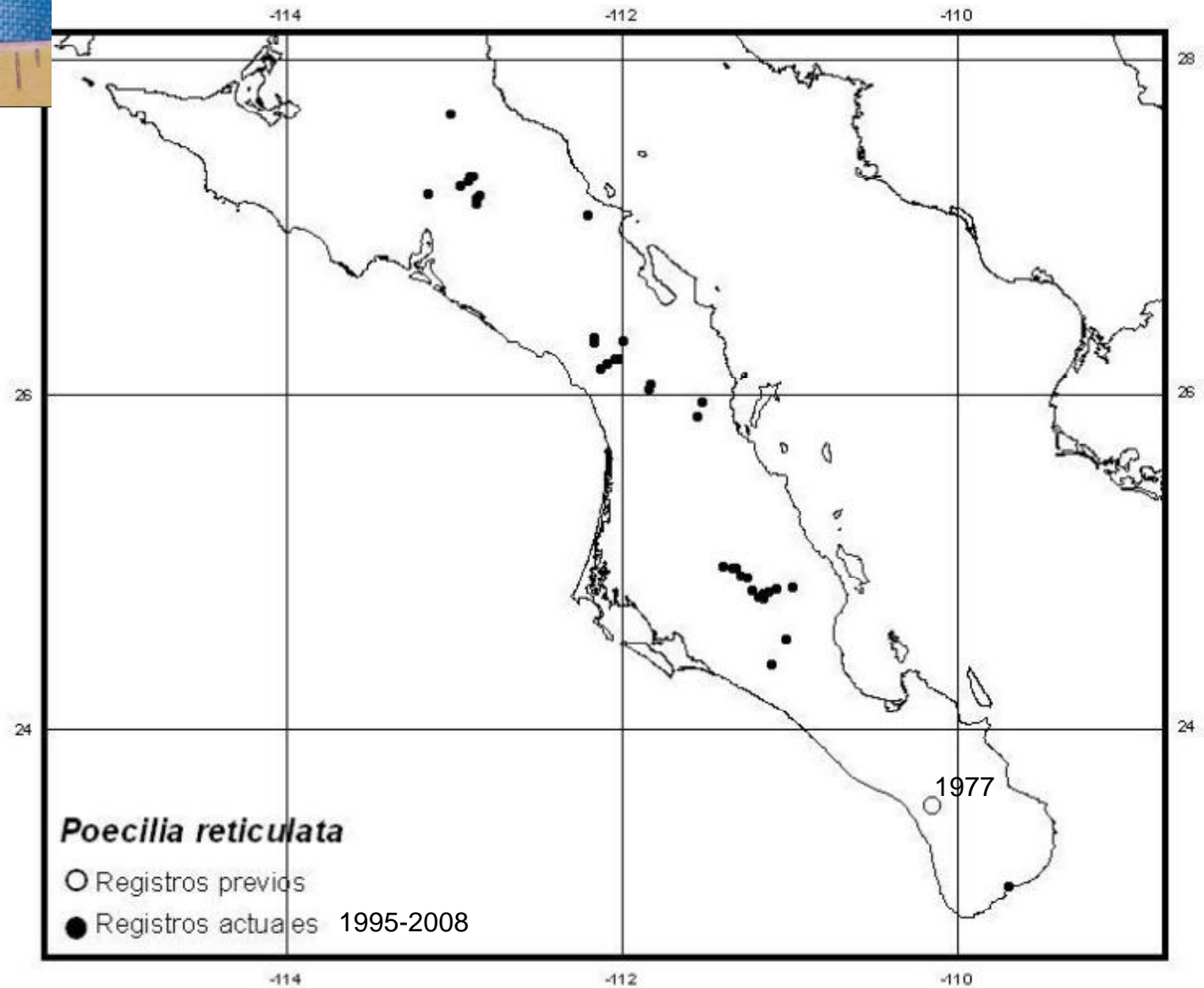
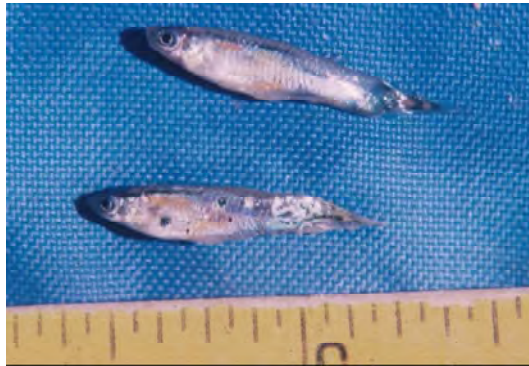
Espadita verde (Xiphophorus hellerii)

**INTRODUCIDAS COMO ESPECIES
DE ORNATO (ACUARISMO)**



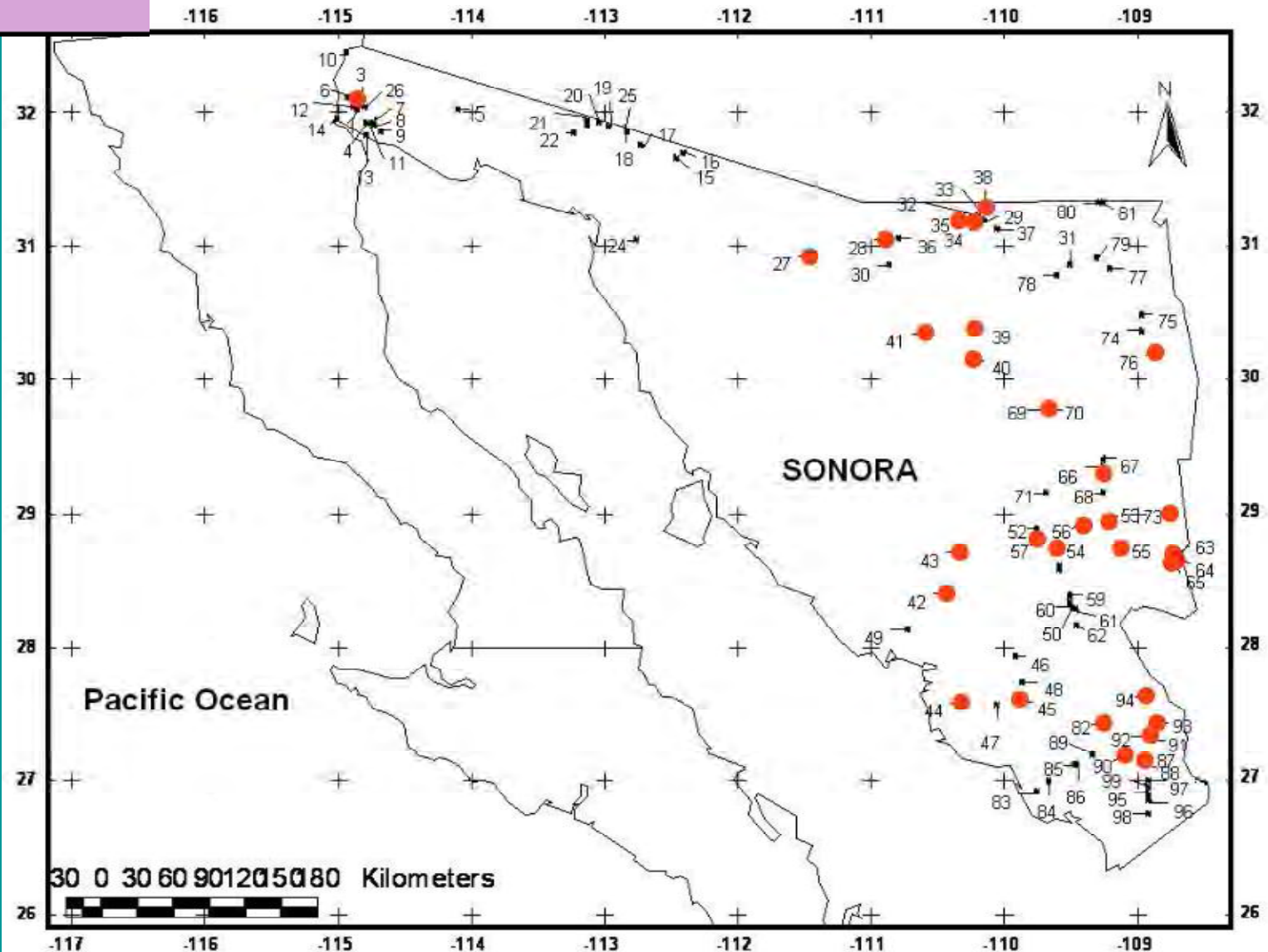
Gupi (Poecilia reticulata)

Registros de *Poecilia reticulata* en Baja California Sur



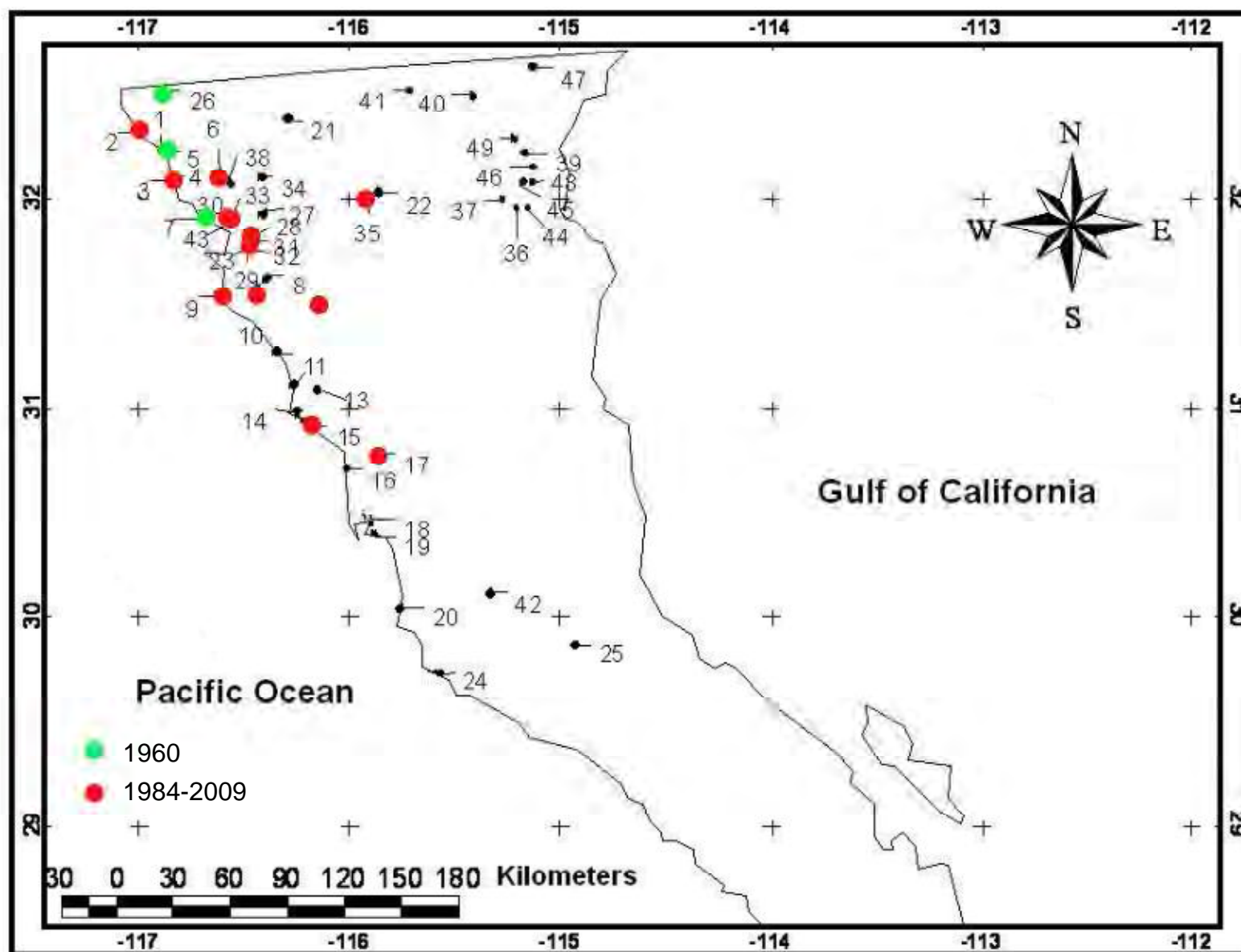


Registros de *Lepomis cyanellus* en Sonora



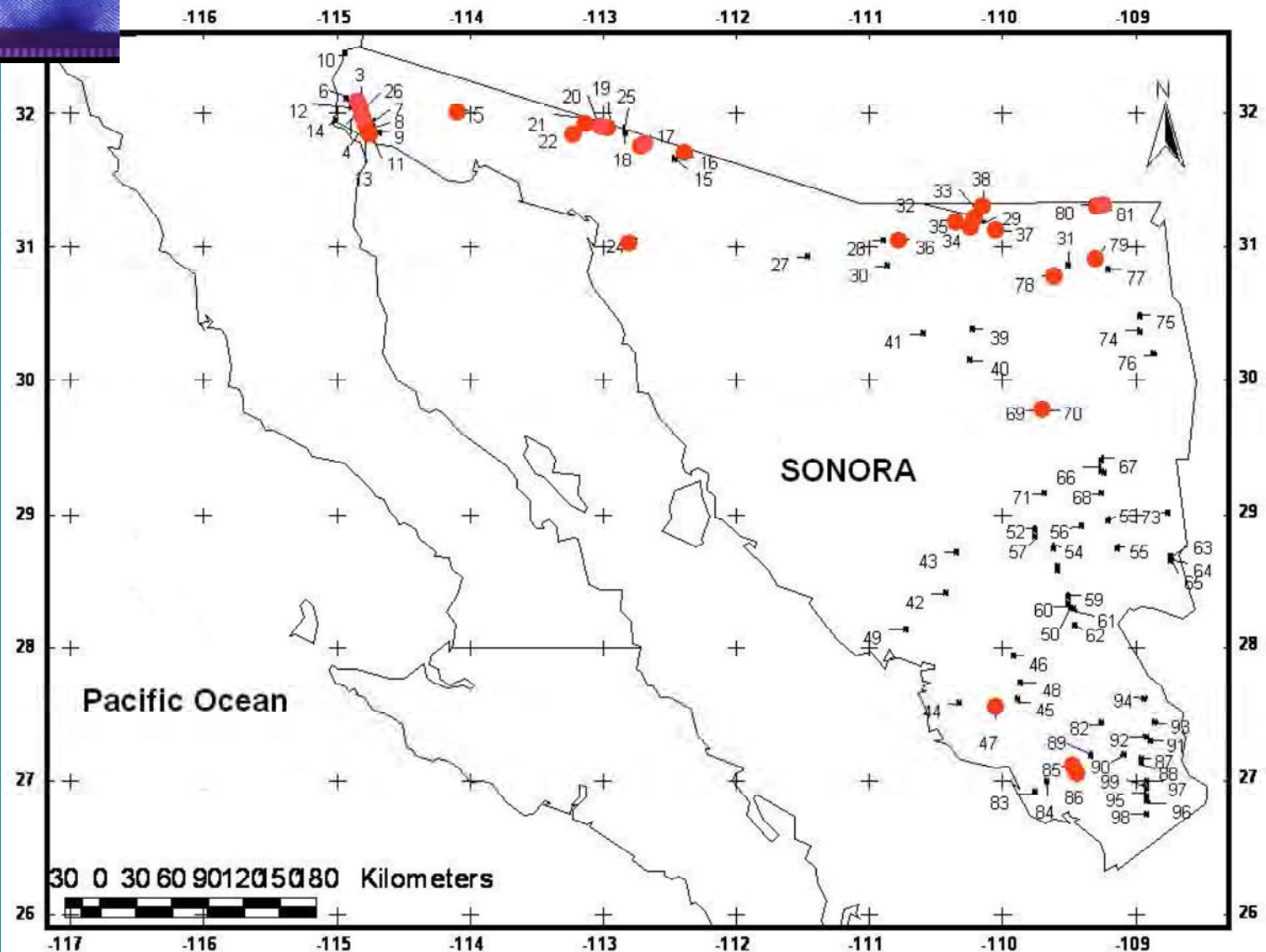


Registros de *Lepomis cyanellus* en Baja California



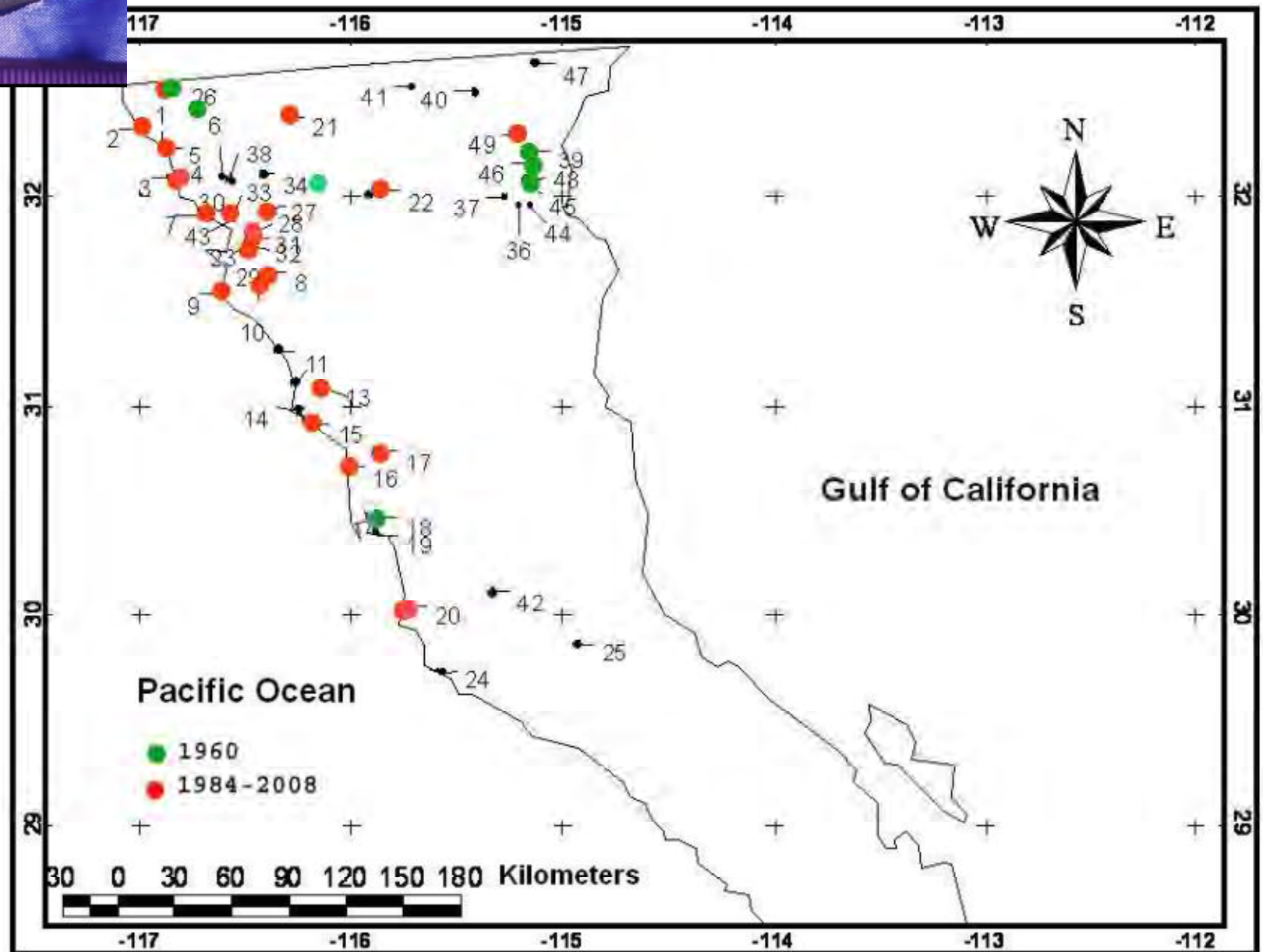


Registros de *Gambusia affinis* en Sonora

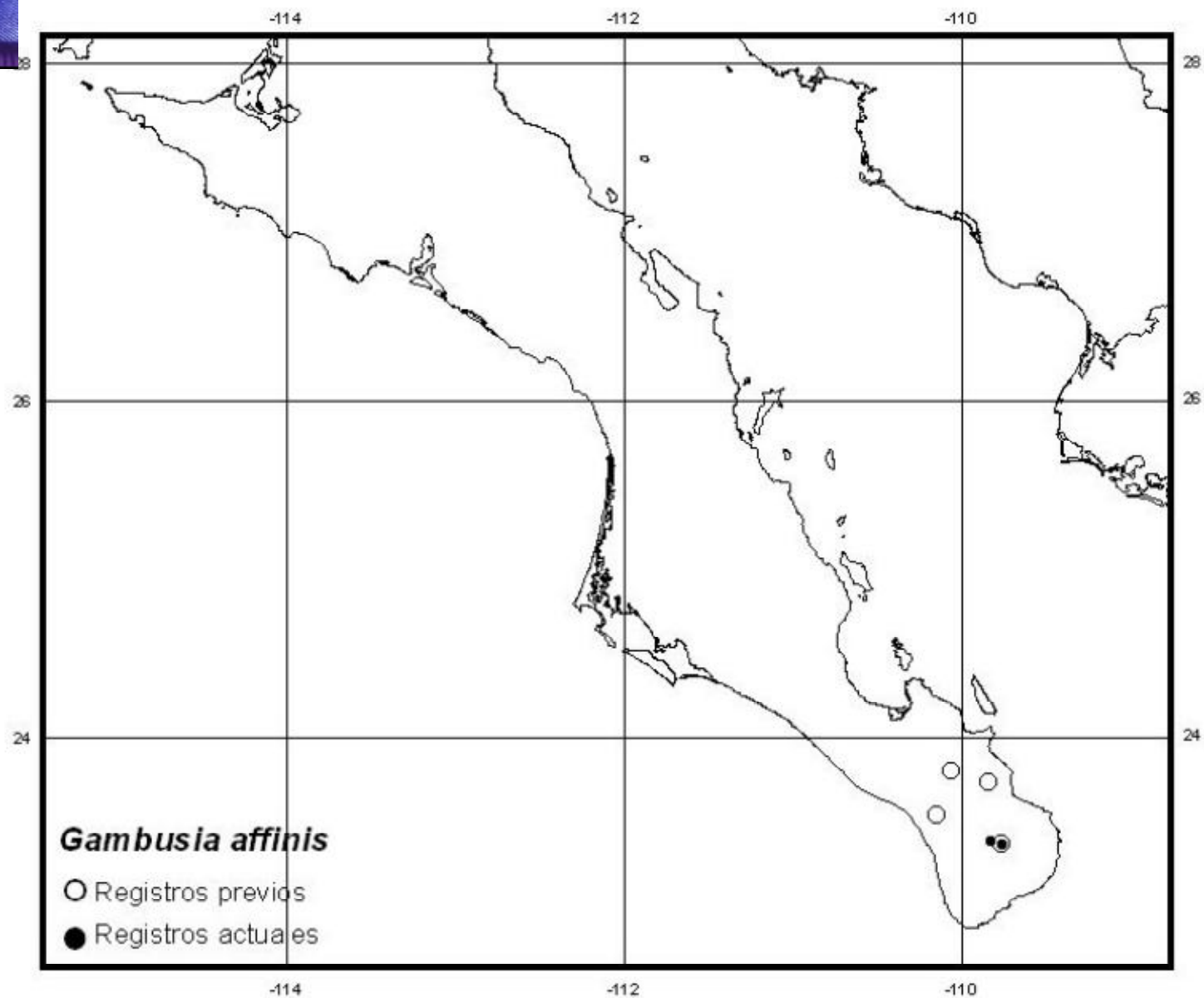




Registros de *Gambusia affinis* en Baja California

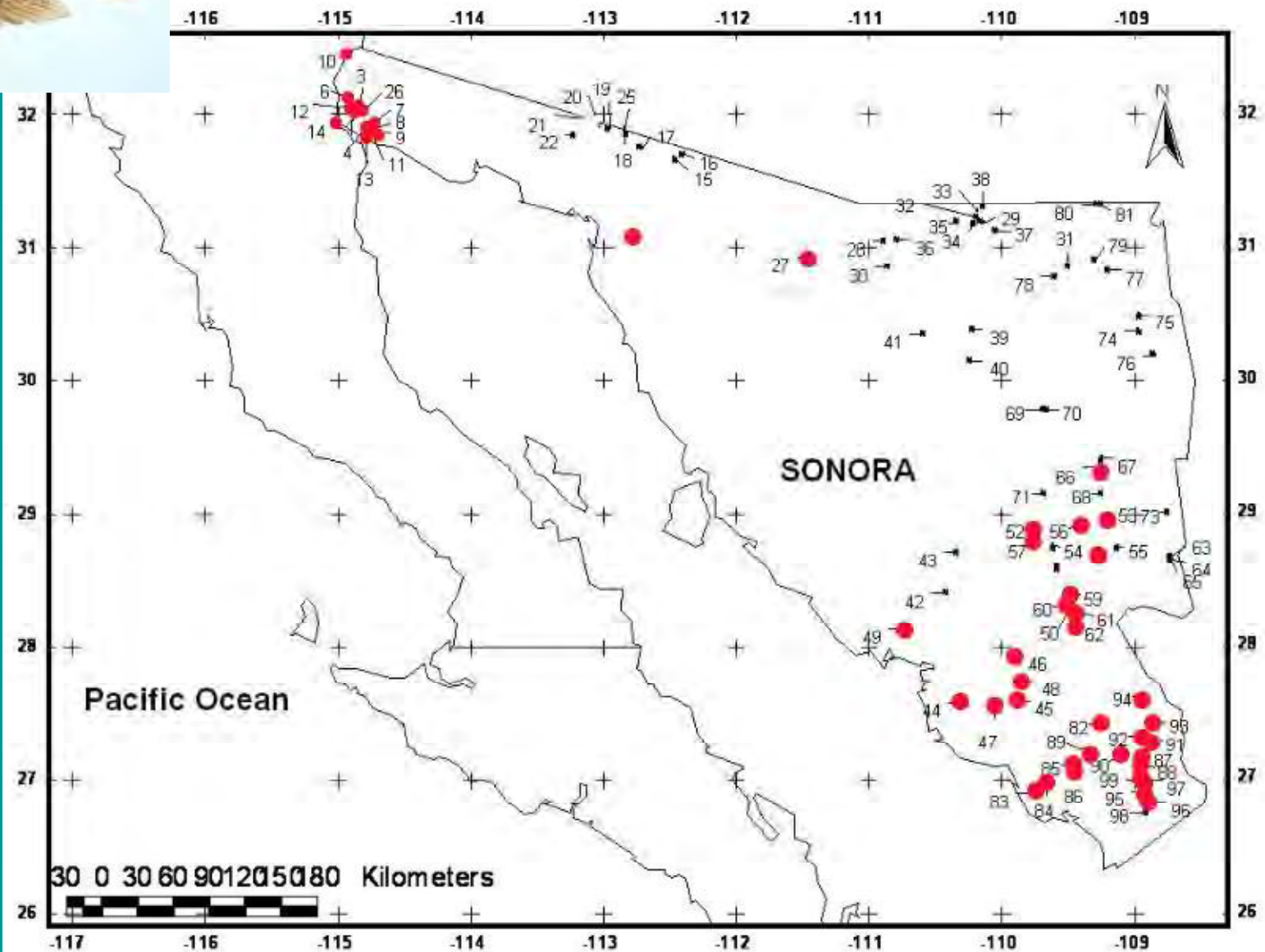


Registros de *Gambusia affinis* en Baja California Sur



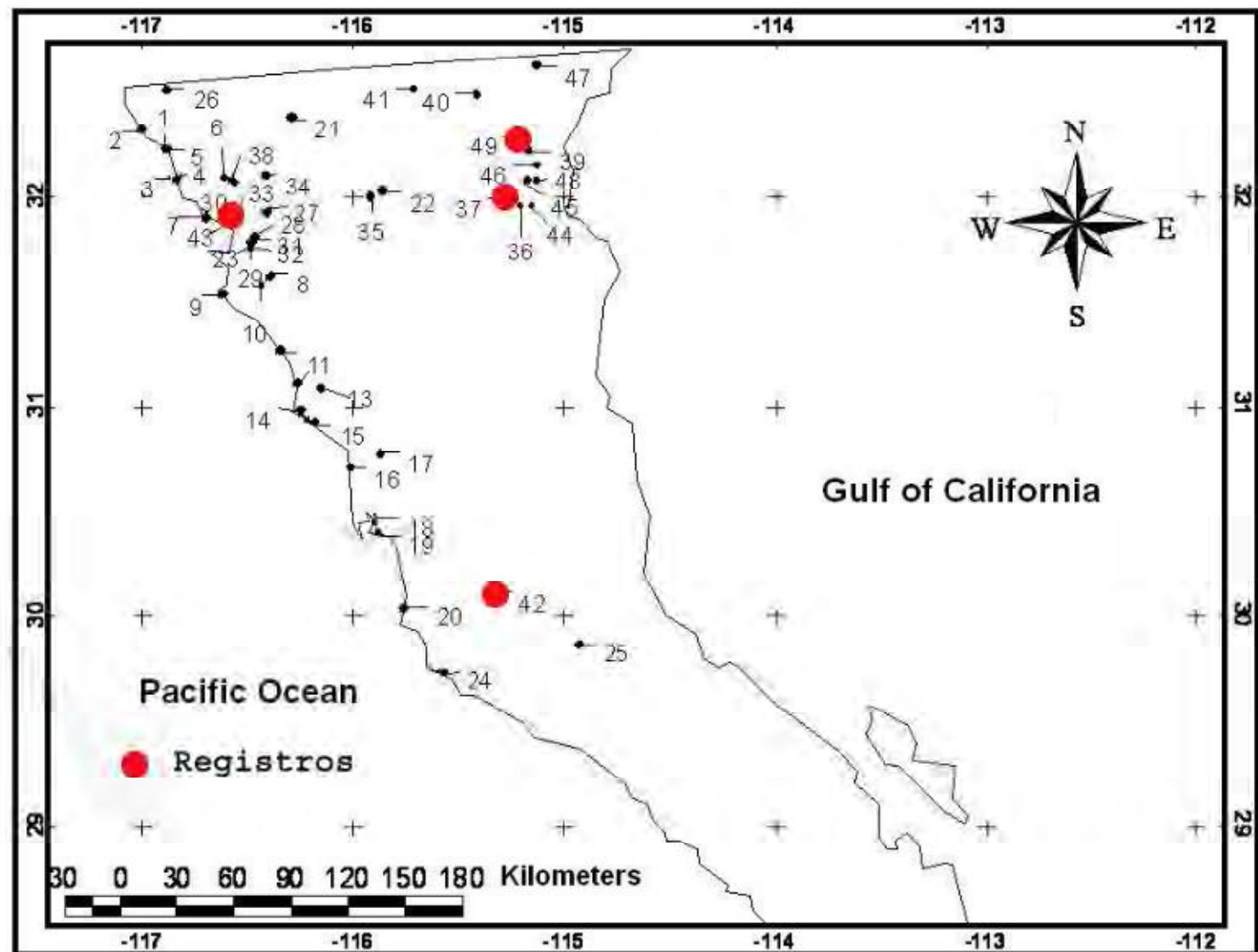


Registros de *Oreochromis mossambicus* en Sonora



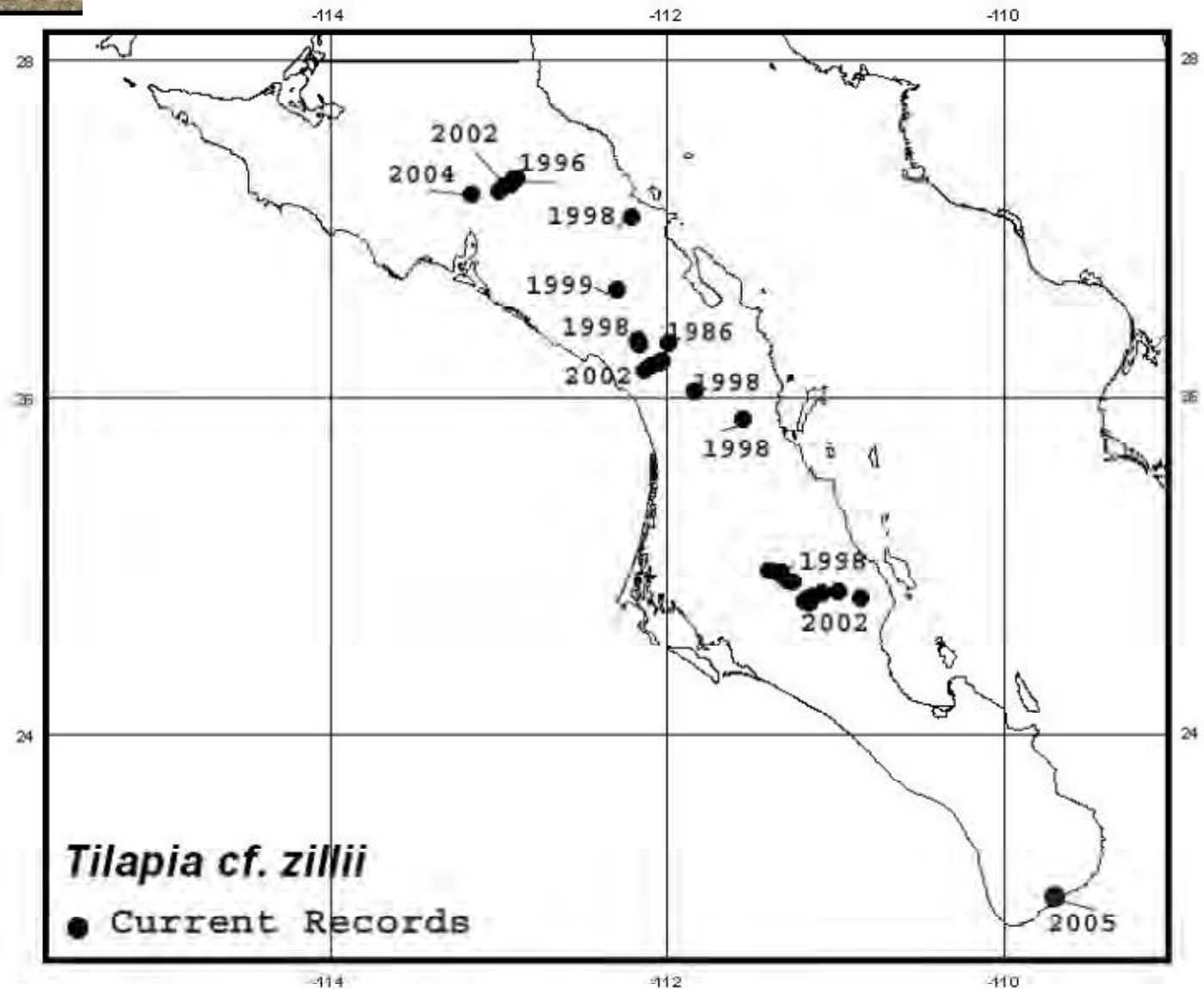


Registros de *Tilapia cf. zillii* en Baja California





Registros de *Tilapia cf. zillii* en Baja California Sur





Family CENTRARCHIDAE

***Lepomis cyanellus* Rafinesque, 1819**

Common name: Green sunfish/ pez sol.

Native range: Native to Great Lakes, Hudson Bay, and Mississippi River basins from New York and Ontario to Minnesota and South Dakota, and south to Gulf of Mexico drainages, including the Rio Grande basin and northern Mexico (Page and Burr, 1991: 267).

Previous records. Baja California: Río Tijuana, 3.2 km E Tijuana; a stream ca. Valle de Santa Rosa at 32.2 km S [sic] Ensenada (Follett, 1960: 228); and Arroyo San Miguel (= Guadalupe or La Misión, CAS-19405). **Baja California Sur:** None.

Recent records. Baja California: Arroyo El Descanso (mouth and adjacent lagoon); mouth of Arroyo La Misión; Arroyo San Antonio de las Minas at Rancho Kodoraki and Rancho La Fortuna; Arroyo Doña Petra at Rancho Madrigal; Rancho Tierra Santa; Rancho Santa Rosa; Charco Escondido [Parque Nacional Constitución 1857]; Arroyo San Carlos at Rancho Las Hamacas and Rancho Alamitos; Arroyo Santo Tomás at Ejido Ajusco and La Bocana Santo Tomás; mouth of Arroyo San Telmo; and Arroyo Santo Domingo at Rancho El Divisadero. **Baja California Sur:** None.

Comments: The non-native presence of green sunfish in the streams of the Mediterranean region of Baja California, was first reported by Follett (1960: 228) for the Santa Rosa valley (a tributary to Arroyo Guadalupe) on the basis of a personal communication via Dr. Carl L. Hubbs. This exotic centrarchid is a possible predator of the native threespine stickleback (*Gasterosteus aculeatus*) in the mouth of the Río El Descanso and its adjacent lagoon (Sánchez-González and Ruiz-Campos et al., 2001: 192).

**INVASORES PRESENTES EN EL NOROESTE DE MEXICO DESDE
2007 (SINALOA) Y SONORA (2009). PECES DIABLO
(*Hypostomus* spp.)**



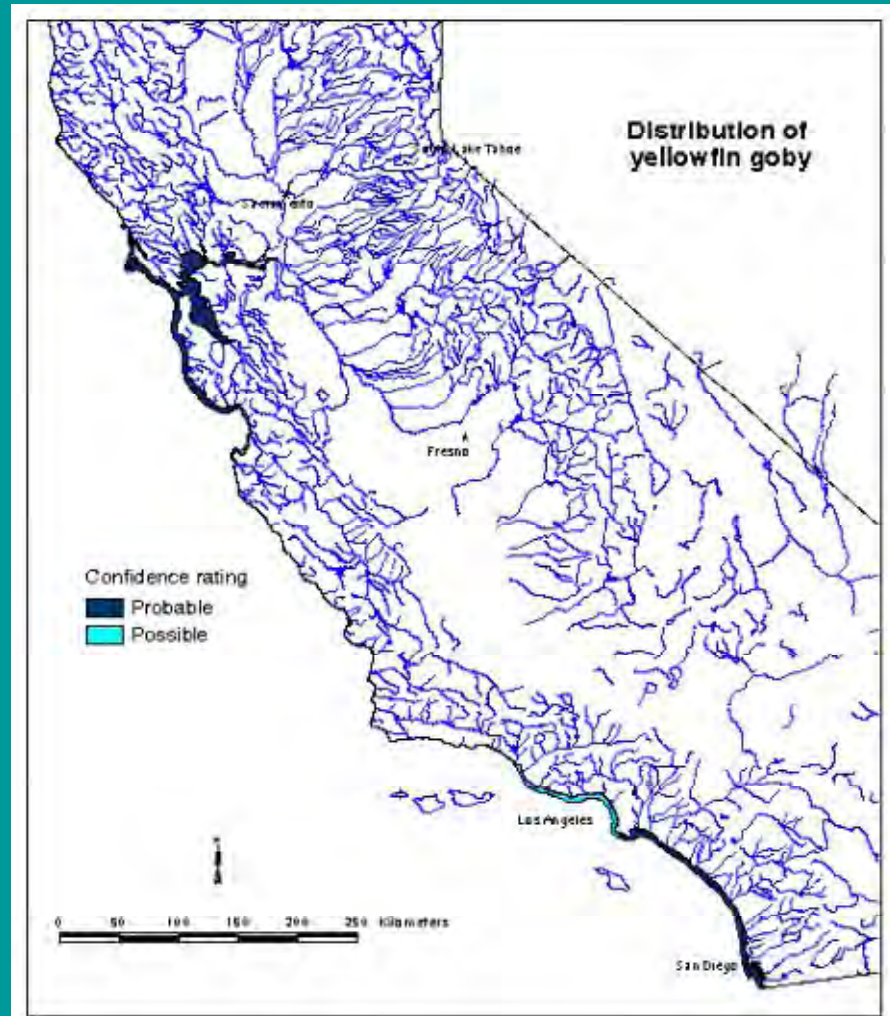
**Ciénaga Santa Clara, Alto Golfo de
California, Sonora
25 Junio 2009**



**Río Culiacán, Navolato, Sinaloa
27 Septiembre 2009**

INVASOR POTENCIAL

GOBIO ASIATICO (*Acanthogobius flavimanus*)





PROGRAMAS DE CONTROL Y ERRADICACIÓN DE EXÓTICOS

FACTORES CAUSALES DE LA PROBLEMÁTICA DE PECES EXOTICOS EN EL NOROESTE DE MEXICO

- **DESCONOCIMIENTO DE LA BIOLOGIA DE LAS ESPECIES NATIVAS Y DE SU POTENCIALIDAD DE APROVECHAMIENTO**
- **INTRODUCCION DE ESPECIES EXOTICAS EN SISTEMAS ABIERTOS**
- **PROGRAMAS DE EXTENSIONISMO Y PISCULTURA RURAL INADECUADOS**
- **MODIFICACION DE HABITAT QUE PROMUEVE LA INVASION POR ESPECIES EXOTICAS O INVASORAS EURIHALINAS**
- **CARENCIA DE REGULACION Estricta EN LA IMPORTACION, MANEJO Y VENTA DE PECES DE ORNATO**
- **FALTA DE PROGRAMAS DE ERRADICACION Y CONTROL DE PECES EXOTICOS**



MUCHAS GRACIAS